Animal Waste Management Plan

for

Small Acres Dairy

Henderson County, North Carolina

Prepared In Cooperation With:

North Carolina Division of Soil and Water Conservation

Henderson Soil and Water Conservation District

USDA - Natural Resources Conservation Service

JUNE 1996

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SYSTEM OVERVIEW

This Animal Waste Management System consists of the following major components:

1. WASTE WATER STORAGE POND
2. IRRIGATION AND AGITATION SYSTEM
3. WASTE WATER COLLECTION AND PIPING SYSTEM
4. SOLID WASTE STORAGE STRUCTURE

and the following associated components:

6. CONCRETE CURBING
7. VEGETATED DIVERSION
8. ROCK LINED OUTLET
9. CRITICAL AREA PLANTING

All solid waste will be scraped from the lots and stored in the new earthen SOLID WASTE STORAGE STRUCTURE and the existing concrete SOLID WASTE STORAGE STRUCTURE. Solid waste will be loaded from the SOLID WASTE STORAGE STRUCTURES into a manure spreader and land applied at agronomic rates as directed in the WASTE UTILIZATION PLAN. The combination of the two SOLID WASTE STORAGE STRUCTURES will provide ninety (90) days of storage for the solid waste produced by the 250 cow herd.

All contaminated runoff will flow into the WASTE WATER STORAGE POND. This structure is designed to provide storage for normal rainfall runoff from the feedlot and waste water from the milking operation for a sixty (60) day period, and provide storage space for the twenty-five (25) year, twenty-four (24) hour storm runoff from the feedlot. The sideslopes of the WASTE WATER STORAGE POND where runoff is entering will be armored with a concrete entry chute.

Contaminated runoff and waste water from the milking operation will be collected and transported to the WASTE WATER STORAGE POND by the WASTE WATER COLLECTION AND PIPING SYSTEM. Concrete lined ditches will carry contaminated runoff from the concrete lot and existing waste storage structure to the WASTE WATER STORAGE POND. Waste water from the milking operation will flow by gravity through an eight (8) inch diameter PVC pipe into a concrete catch basin. The waste water plus additional contaminated runoff entering the catch basin will travel through a twelve (12) inch diameter PVC pipe into the WASTE WATER STORAGE POND. CONCRETE CURBING will be placed at the perimeter of the lot at several locations to direct contaminated runoff into the WASTE WATER COLLECTION AND PIPING SYSTEM. A VEGETATED DIVERSION located above the dairy farm will reduce the volume of freshwater entering the waste management system.

The waste stored in the WASTE WATER STORAGE POND will be land applied on hayland adjacent to the farm by an IRRIGATION AND AGITATION SYSTEM. The landowner currently owns and has access to a waste pump, traveling irrigation gun, agitating pump and aluminum piping. The existing equipment is capable of applying waste in accordance to the WASTE UTILIZATION PLAN.

This animal waste management system is designed to prevent discharge of animal waste to surface waters except as a result of a storm event more severe than the twenty-five (25) year, twenty-four (24) hour storm, as required by NC DEHNR-DEM Administrative Code Section: 15A NCAC 2H .0200.

All maintenance and operation costs are the responsibility of the landowner and cannot be cost shared.

1. WASTE WATER STORAGE POND

OVERVIEW

The WASTE WATER STORAGE POND is designed to store the average feedlot runoff and waste water from the milk barn for a sixty(60) day period. Additional storage space is included to contain the twenty-five(25) year, twenty-four(24) hour storm runoff from the feedlot. The WASTE WATER STORAGE POND consists of an earthen dam, two(2) concrete inlet chutes for discharging contaminated water into the structure, waste water discharge pipe and a vegetated emergency spillway.

OPERATION

The service life of the WASTE WATER STORAGE POND will be determined by the level of management for the entire system. How effectively the lot is scraped and the time spent scraping of the lot before each storm event will determine the amount of solids which reach the WASTE WATER STORAGE POND. Once the solids have reached the WASTE WATER STORAGE POND, the effectiveness of agitation will determine the amount of solids remaining in the WASTE WATER STORAGE POND.

Over time it is expected that some solids will accumulate in the WASTE WATER STORAGE POND. The accumulated solids should not reduce the usable capacity of the WASTE WATER STORAGE POND to a point which requires removal of the solids for many years IF adequate lot scraping and waste water agitation is maintained. In contrast, poor management will result in the rapid accumulation of solids which will reduce the usable capacity of the WASTE WATER STORAGE POND to the point that some form of dredging will be required. If a large volume of solid waste is allowed to wash from the lot and/or if inadequate agitation is performed, this dredging operation could be required in a very short period of time.

If at any point in the future the usable capacity of the WASTE WATER STORAGE POND becomes reduced to the point that solids must be removed, the removal of these solids can not be cost shared. This procedure is considered part of the maintenance of the system.

MAINTENANCE

The concrete of the WASTE WATER STORAGE POND should be inspected periodically for major cracks. Vegetation on the dam should be inspected periodically and reseeded as needed to maintain a vigorous stand. The dam should be mowed at least annually to prevent woody growth. Mowing operations must take place only when the soil of the dam is dry, and vegetation should not be mowed to a height of less than four(4) inches at any time. See CRITICAL AREA PLANTING for further

maintenance requirements. Any evidence of sloughing, seepage, boils, bulging, sink holes or misalignment should be reported to the Henderson Soil & Water Conservation District office immediately.

2. IRRIGATION AND AGITATION SYSTEM

OVERVIEW

The IRRIGATION AND AGITATION SYSTEM consists of a PTO driven agitator, PTO driven irrigation pump, traveling irrigation gun, and aluminum pipe. The IRRIGATION AND AGITATION SYSTEM applies liquid from the waste STORAGE pond on to the adjacent pasture land.

OPERATION

Irrigation operation shall be initiated prior to the liquid level reaching the full storage level marker in the structure. When the liquid level in the WASTE WATER STORAGE POND reaches the marker, liquids must be removed by pumping from the structure into the irrigation system. Do not irrigate in such a manner as to cause runoff or erosion. Do not irrigate on frozen or saturated soils. Irrigate only until soil is near saturation point. Operation of the system and its components shall be in accordance with all manufacturers' specifications and the WASTE UTILIZATION PLAN.

MAINTENANCE

Soil test the irrigation field annually. Vegetation in the irrigation field should be inspected periodically and reseeded as needed to insure a vigorous stand. The field may also need to be limed and fertilized annually. It is essential that neither vehicles or livestock be allowed to create travel lanes within the irrigation field. The irrigation field shall be mown for hay. Mowing operations must take place only when the soil is dry, and the vegetation should not be mowed to a height of less than four(4) inches. See CRITICAL AREA PLANTING for further maintenance requirements.

3. WASTE WATER COLLECTION AND PIPING SYSTEM

OVERVIEW

The WASTE WATER COLLECTION AND PIPING SYSTEM consists of one(1) concrete drop box, 12" and 8" PVC piping, two (2) concrete entry chutes, and two (2) concrete lined ditches. The existing 8" PVC milkroom outlet pipe will be routed to the concrete drop box, the concrete drop box will also be used to collect a small amount of lot runoff present at the location of the concrete drop box. A 12" PVC pipe will carry the lot runoff and milkroom water from the concrete drop box to a concrete pond inlet chute. Concrete inlet chute will also carry lot runoff from the lower feedlot into the WASTE WATER STORAGE POND. A concrete lined ditch will carry lot runoff from the upper feedlot to an intersection with the concrete lined ditch coming from the existing manure pit. The combined runoff will flow down the concrete lined ditch to another concrete pond entry chute and into the WASTE WATER STORAGE POND.

MAINTENANCE

Inspect the concrete components of the WASTE WATER COLLECTION AND PIPING SYSTEM for cracks or other damage, and make repairs or replace as needed. Inspect the drop structure seasonally and remove accumulated solids.

4. SOLID WASTE STORAGE STRUCTURE

OVERVIEW

The SOLID WASTE STORAGE STRUCTURE is designed to store seventy (70) days accumulation of solid waste produced by a 250 head milking herd. The SOLID WASTE STORAGE STRUCTURE consists of an earthen pit with a non-reinforced concrete slab and reinforced concrete entry ramp. Push-off ramps will be located at two locations around the structure.

OPERATION

Waste will be scraped on a regular basis, preferably daily. Whenever weather, soil, and crop conditions permit, the waste should be loaded directly into a solid manure spreader, transported to the application field, and applied according to the WASTE UTILIZATION PLAN. When conditions do not permit immediate application, the solid waste will be scraped into the SOLID WASTE STORAGE STRUCTURE until conditions allow land application. Waste should be applied in such a manner and at

such times as to take advantage of the maximum available nutrients from the manure for crop growth. For maximum nutrient utilization, fresh waste should be land applied and incorporated into the soil. See the WASTE UTILIZATION PLAN for further details of application.

MAINTENANCE

The SOLID WASTE STORAGE STRUCTURE will need to be inspected periodically for evidence of sloughing, seepage, boils, bulging, sink holes or misalignment. Report any damage or problems to the Henderson Soil and Water Conservation District immediately. Inspect all concrete components for major cracks.

5. CONCRETE CURBING

OVERVIEW

The CONCRETE CURBING constructed on the lot will prevent waste water from leaving the lot in any storm less severe than the twenty-five (25) year, twenty-four (24) hour storm.

MAINTENANCE

The concrete should be checked periodically for major cracks. Eliminate any vegetation growing in the CONCRETE CURBING by treatment with a herbicide.

6. VEGETATED DIVERSION

OVERVIEW

The VEGETATED DIVERSION will be located above the upper feedlot and will convey non-contaminated runoff around the upper feedlot and away from contaminated areas.

MAINTENANCE

The vegetation in the diversion should be inspected periodically and reseeded as needed to insure a vigorous stand. It is essential that neither vehicles or livestock be allowed to create travel lanes within the diversion. The diversion should be mowed at least annually to prevent woody growth. Mowing operations must take place only when the soils are dry, and vegetation should not be mowed to a height of less than four(4) inches. If sedimentation reduces the capacity of the channel, contact the Henderson County Soil & Water Conservation District for technical assistance in correcting the problem. See CRITICAL AREA PLANTING for further maintenance requirements.

7. CRITICAL AREA PLANTING

OVERVIEW

Any areas of exposed soil which will not be covered by a structure shall be seeded to permanent vegetation. CRITICAL AREA PLANTING applies to the VEGETATED DIVERSION, SOLID WASTE STORAGE STRUCTURE and WASTE WATER STORAGE POND.

MAINTENANCE

Soil samples should be taken at least once per year. Fertilizer and lime should be applied at the rates recommended as a result of the soil test. Fertilizer and lime should be applied either during September-October or February-March. Vegetation should be inspected periodically and reseeded as needed to insure a vigorous stand. It is essential that neither vehicles or livestock be allowed to use any area that has been treated with CRITICAL AREA PLANTING as a travel lane. All CRITICAL AREA PLANTING should be mowed at least annually to prevent woody growth. Mowing operations must take place only when the soil is dry and vegetation should not be mowed to a height of less than four(4) inches at any time. Do not mow cool season grasses during periods when plants are showing signs of drought stress.

GENERAL COMMENTS

REPAIRS

Notify the Henderson Soil & Water Conservation District if repairs or major modifications are required for any of the components of this waste management system.

Waste Water Storage Pond Volume Calculations

250 lactating cows, 1400 pounds each, 100% confinement, 3X milking

Watershed area = 69,700 SF (1.6 AC), impervious (CN = 98)

60 day storage period

Critical rainfall period - Dec thru Feb (rainfall = 6.7 in, evaporation = 1.6 in)

25 year, 24 hour storm event = 7.5 in

WASTE WATER VOLUME = (250 cows)(1400 lbs/cow)(0.60 ft^3/day/1000 lbs)(60 days) = **12,600 ft^3**

RUNOFF VOLUME(60 day)
CN=98 S=(1000/98) - 10 = 0.20 in
Q = [(5.1 in) - 0.2(0.20 in)]^2/[5.1 in + (0.8)(0.20 in)] = 4.9 in
Volume = (4.9 in)(1 ft/12 in)(69,700 ft^2) = **27,730 ft^3**

RUNOFF VOLUME(25yr-24hr storm)
Q = [(7.5 in) - 0.2(0.20 in)]^2/[7.5 in + (0.8)(0.20 in)] = 7.3 in
Volume = (7.3 in)(1 ft/12 in)(69,700 ft^2) = **41,300 ft^3**

MINIMUM VOLUME REQUIREMENT
12,600 ft^3 + 27,730 ft^3 + 41,300 ft^3 = 81,630 ft^3

PLANNED POND VOLUME PER DESIGN APPROVED 06/27/96 = **100,710 ft^3**
(volume measured from bottom to 1.0 ft below top of dam, elev. 87.0)

Volume depth is reduced to accommodate precipitation falling directly on the pond surface and to operate the emergency spillway. Available volume is measured from the pond bottom (elev = 82 ft) to elev = 86.2 ft. (VOLUME = **81,100 ft^3 approx.)

Solid Waste Storage Volume Calculations

MANURE VOLUME = (250 cows)(1400 lbs/cow)(1.32 ft³/day/1000 lbs)(90 days) = **41,580 ft³**

(250)(1400 lbs/cow)(1.32 ft³/day/1000 lbs)(80 days) = 36,960 ft³

WASTED FEED AND BEDDING VOLUME = [(1000 lbs/day)/(10.5 lbs/ft³)](90 days) = **8571 ft³**

[(1000 lbs/day)/(10.5 lbs/ft³)](80 days) = 7,619 ft³

MINIMUM VOLUME REQUIREMENT
41,580 ft³ + 8571 ft³ = 50331 ft³

* Min on 80 days storage * 44,579 ft³

STORAGE VOLUME IN EXISTING CONCRETE MANURE PIT = (32 ft)(5 ft)(35 ft) + (32ft)(5 ft)(40 ft)(.5) = **8800 ft³**

PLANNED EARTHEN STORAGE PIT VOLUME PER DESIGN APPROVED 06/27/96 = **38,710 ft³** (volume measured from bottom to 1.0 ft below top of dam, elev. 87.0, includes ramp)

Storage 8,800 ft³ + 38,710 ft³ = 47,510 ft³

Total *planned* solid waste storage period is approximately 85 to 90 days. Factors such as rainfall, diet, bedding material and management will cause the storage period to fluctuate.

* Surplus of 2,931 ft³ on 80 day storage.

Animal Waste Land Application Calculations

All computations determining application rates and loadings of animal waste to hayland and row crops are found in the WASTE UTILIZATION PLAN attached at the end of this document. Application of animal waste shall be in accordance the WASTE UTILIZATION PLAN will follow the following criteria.

1. The waste utilization plan will include all the waste generated on the farm.

2. Animal waste shall not be applied to wetlands or surface water or shall not reach wetlands or surface waters of the state by runoff, drift, manmade conveyances, direct application, or direct discharge during operation or land application. Proper application rate and method shall be used to ensure these specifications are met.

3. Animal waste shall be applied on land eroding at less than 5 tons per acre per year. Waste may be applied to land eroding at more than 5 tons per acre providing grass filter strips are installed where runoff leaves the field.

4. Animal waste shall not be applied to saturated soils, during rainfall events, or when the surface is frozen. When animal waste is to be applied on areas subject to flooding, it will be soil incorporated on conventionally tilled cropland. When applied to conservation tilled crops or grassland, the waste may be broadcast provided the application does not occur during a season prone to flooding.

5. Waste shall not be applied more than 30 days prior to planting of the crop or forages breaking dormancy. A suitable cover crop should be planted to scavenge nutrients especially in sandy, leachable soils. On soils with a high potential for leaching, multiple applications at lower rates should be used.

6. Animal waste shall not be applied closer than 25 feet to surface water. This distance may be reduced for waters that are not perennial provide adequate vegetative filter strips are present.

7. Animal waste shall not be applied closer than 100 feet to wells.

8. Animal waste shall not be applied within 200 feet of dwellings other than those owned by the landowner.

9. Waste shall be applied in a manner not to reach other property and public right-of-ways.

10. Animal waste applied on grassed waterways shall be at agronomic rates and in a manner that causes no runoff or drift from the site.

11. Apply animal waste at rates that do not exceed the nitrogen needs for realistic yield expectation (RYE) for the crop being grown.

12. Annual soil test is recommended and shall be made no less than once every two years. Liquid waste analysis is recommended prior to each application event and will be made twice each year for nutrient content consistent with the WASTE UTILIZATION PLAN.

13. Liquid waste shall be applied at rates not to exceed the soil infiltration rate. No ponding shall occur.

14. Records of waste application shall be maintained to establish actual application rates. The record will include date of application, amount of waste applied per acre by tract number and field number, most recent waste analysis and soil test report, and the realistic yield expectation nitrogen rate.

COST ESTIMATE
(Based on NCACSP Average Cost Guide PY 96)

Waste Water Storage Pond
Excavation: 2280 CY @ $2.00/CY = $4560.00
Fill (including compaction): 2200 CY @ $2.30/CY = $5060.00
Concrete entry chutes: 2 @ 3.5 CY ea = 7 CY @ $100.00/CY = $700.00
Reinforcing steel (6x6-10x10 wwf): 500 SF = 110 lbs @ $.74/lb = $81.40
Critical area planting (dam): 0.25 AC @ $203.00/AC = $50.75
Mulching (dam): 0.25 AC @ $300.00/AC = $75.00
Silt fence: 500 LF @ $1.00/LF = $500.00
Total: $11,027.15

Solid Waste Storage Pit
Excavation: 1260 CY @ $2.00/CY = $2520.00
Fill (including compaction): 780 CY @ $2.30/CY = $1794.00
Concrete slab: 90 CY @ $100.00/CY = $9000.00
Concrete ramp: 12 CY @ $100.00/CY = $1200.00
Reinforcing steel (6x6-10x10 wwf): 900 SF = 190 lbs @ $.74/lb = $140.60
Critical area planting (dam): 0.15 AC @ $203.00/AC = $30.45
Mulching (dam): 0.15 AC @ $300.00/AC = $45.00
Total: $14,730.05

Push-off Ramp A
Concrete: 6 CY @ $100.00/CY = $600.00
Curbing: 1 CY @ $250.00/CY = $250.00
Reinforcing steel (6x6-10x10 wwf): 340 SF = 71 lbs @ $.74/lb = $52.54
Reinforcing steel (#4): 100 LF = 67 lbs @ $.74/lb = $49.58
Push-off barrier: ($200 estimate)
Total: $1,152.12

Push-off Ramp B
Concrete: 5.5 CY @ $100.00/CY = $550.00
Curbing: 2 CY @ $250.00/CY = $500.00
Reinforcing steel (6x6-10x10 wwf): 280 SF = 60 lbs @ $.74/lb = $44.40
Reinforcing steel (#4): 200 LF = 134 lbs @ $.74/lb = $99.16
Push-off barrier: ($200 estimate)
Total: $1,393.56

Concrete Curbing (170 LF)
Concrete: 13 CY @ $250.00/CY = $3250.00
Reinforcing steel (#4): 925 LF = 618 lbs @ $.74/lb = $457.32
Total: $3,707.32

PVC Pipe
8" PVC SDR-35 Sewer & Drain Pipe: 120 LF @ $8.00/LF = $960.00
12" PVC SDR-35 Sewer & Drain Pipe: 140 LF @ $16.00/LF = $2240.00
Total: $3,200.00

Catch Basin
Concrete: 1.25 CY @ $250.00/CY = $312.50
Reinforcing steel (#4): 160 LF = 107 lbs @ $.74/lb = $79.18
Total: $391.68

Concrete Lined Ditch
Concrete: 25 CY @ $100.00/CY = $2500.00
Reinforcing steel (6x6-10x10 wwf): 2040 SF = 428 lbs @ $.74/lb = $317.00
Total: $2,817.00

Vegetated Diversion
Earthfill and excavation (estimate only): 110 CY @ $2.00/CY = $220.00

PROJECT TOTAL: $38,638.88

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA
ANIMAL WASTE STORAGE POND
VOLUME COMPUTATIONS

GIVEN: 250 LACTATING COWS (HOLSTEIN) 1400 LBS/EA.
100% CONFINEMENT
3X MILKING
SOLIDS ARE SEPARATED AND STORED IN STACKING FACILITY.
1.6 ACRE WATERSHED (ALL IMPERVIOUS) 69,700 FT^2
LOCATION: HENDERSON-NORTH
MINIMUM STORAGE PERIOD: 60 DAYS
25 YR, 24 HR STORM PRECIP.: 7.5 IN.
CRITICAL STORAGE PERIOD: DEC. - FEB.
FROM: WEATHER AND CLIMATE IN N.C. BY NCCES (AG-375) 11/92
RAINFALL (DEC. - FEB.) = 6.7 IN
EVAPORATION (DEC. - FEB) = 1.6 IN
POND SURFACE DIMENSIONS 225 x 115 (APPROX.)
* SHAPE DETERMINED BY SITE RESTRICTIONS
* DESIGN DEPTH CAN NOT EXCEED 5.0 FEET WITHOUT LIFT STATION. (SOILS LIMITATION)

FIND: VOLUMES REQUIRED TO STORE WASTEWATER, RUNOFF, SOLIDS ACCUMULATION AND PRECIPITATION FALLING ON THE POND

ASSUME: SOLID WASTE (MANURE) ENTERING THE POND IS NEGLIGIBLE

CALCULATIONS:

TABLE 4-6 NMAFH

WASTE WATER VOLUME

$$(250\ \text{COWS})(1400\ \text{LBS/COW})\left(0.60\ \frac{\text{FT}^3/\text{D}}{1000\ \text{LBS}}\right)(60\ \text{DAYS}) =$$

$$12{,}600\ \text{FT}^3 / 60\ \text{DAYS}$$

RUNOFF VOLUME

1.6 ACRES (69,700 FT²) IMPERVIOUS AREA

CONCRETE LOT AND ROOF STRUCTURES

$$CN = 98$$

$$S = \left(\frac{1000}{98}\right) - 10 = 0.20\ \text{IN}$$

RAINFALL LESS EVAPORATION = 6.7 IN − 1.6 IN = 5.1 IN.

$$Q_{\text{PRECIP.}} = \frac{[(5.1\ \text{IN}) - 0.2(0.20\ \text{IN})]^2}{[5.1\ \text{IN} + (0.8)(0.20\ \text{IN})]}$$

$$= 4.9\ \text{IN}$$

$$\text{RUNOFF VOLUME}_{\text{PRECIP.}} = (4.9\ \text{IN})\left(1\ \text{FT}/12\ \text{IN}\right)(67{,}900\ \text{FT}^2) = 27730\ \text{FT}^3$$

$$Q_{\substack{25\text{YR }24\text{HR}\\ \text{STORM}}} = \frac{[(7.5\ \text{IN}) - 0.2(0.20\ \text{IN})]^2}{[(7.5\ \text{IN}) + 0.8(0.20\ \text{IN})]}$$

$$= 7.3\ \text{IN}$$

$$\text{RUNOFF VOLUME}_{\substack{25\text{YR-}24\text{HR}\\ \text{STORM}}} = (7.3\ \text{IN})\left(1\ \text{FT}/12\ \text{IN}\right)(67{,}900\ \text{FT}^2) = 41{,}300\ \text{FT}^3$$

CALCULATIONS (CONT.)

SOLIDS ACCUMULATION (ESTIMATION ONLY)

$(3\,IN)\left(\frac{1\,FT}{12\,IN}\right)(67{,}900\,FT^2) = 16{,}975\,FT^3 \approx 17{,}000\,FT^3$

REQUIRED VOLUME = $98630\,FT^3$

RECTANGULAR POND L x W

BOTTOM DIMENSIONS (2:1 SIDE SLOPES) 195' x 85'

DESIGN DEPTH = 4.0 FT.

$V = \frac{[(4)(2)^2(4)^3]}{3} + (2)(195)(4)^2 + (2)(85)(4)^2 + (195)(85)(4)$

$V = 341.3 + 6240 + 2720 + 66300$

$V = 75{,}600\,FT^3$

DESIGN DEPTH = 5.0 FT.

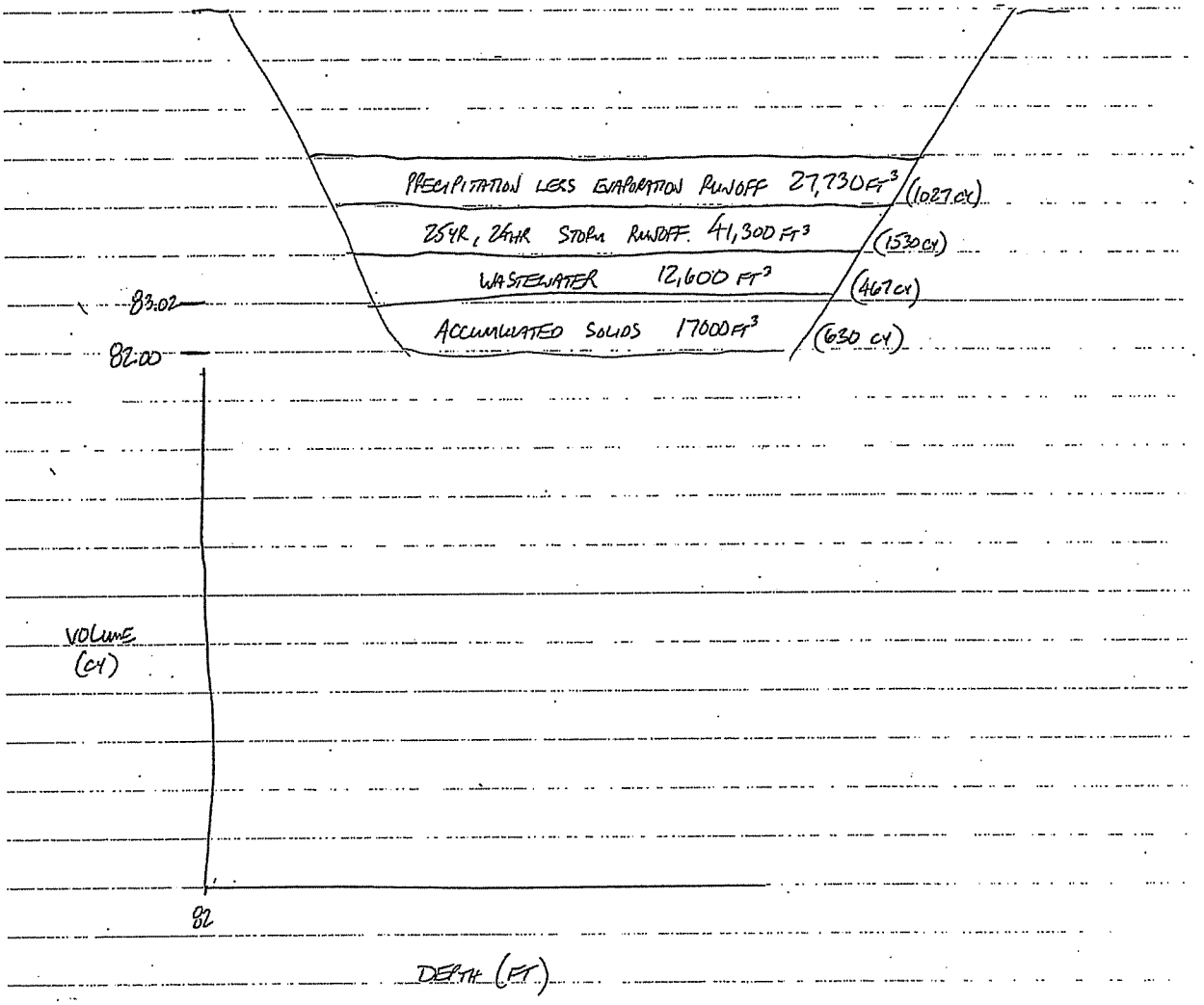
$V = \frac{[4(2)^2(5)^3]}{3} + (2)(195)(5)^2 + (2)(85)(5)^2 + (195)(85)(5)$

$= 667 + 9750 + 4250 + 82875$

$= 97{,}540\,FT^3$ CLOSE

SEE EAGLE POINT DATA FOR FINAL VOLUME AND DIMENSIONS

CALCULATIONS (CONT.)



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SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

ANIMAL WASTE MANAGEMENT CALCULATIONS

GIVEN: 250 HOLSTEIN COWS (LACTATING) 1400 LBS EA.
60 DAY STORAGE
1.6 AC. WATERSHED (IMPERVIOUS) CN = 95
25 YR - 24 HR STORM ⇒ 7.5 INCHES
CRITICAL STORAGE PERIOD - DEC. & JAN.
JAN. - 3.39 IN
DEC. - 3.30 IN
6.69 IN -
MONTHLY EVAPORATION FOR DEC & JAN. = 1.02 INCHES
TORAWAY LOAM SOIL AT APPLICATION SITE FOR WASTE
(2-5% O.M.; POORLY DRAINED)
* NCDA ANALYSIS ⇒ 2.5 LBS. N, 0.8 LBS. P_2O_5,
1.7 LBS K_2O PER 1000 GALLONS
APPLICATION TO FIELD OF FESCUE HAY
NITROGEN IS LIMITING NUTRIENT

ASSUME: 3X MILKING
MANUAL COW PREP
SOLID WASTE IS COLLECTED AND STORED
IN A SEPARATE STRUCTURE AND APPLIED
TO OTHER LAND.
APPLY TO LAND BY IRRIGATION (SPRAY TYPE)

CALCULATIONS:

WASTEWATER PRODUCTION:

BULK TANK - $(50\ \text{GAL/WASH})(3\ \text{WASHES/DAY})(60\ \text{DAYS}) = 9000\ \text{GAL.}$
PIPELINE - $(100\ \text{GAL/WASH})(3\ \text{WASHES/DAY})(60\ \text{DAYS}) = 18000\ \text{GAL.}$
MISC. EQUIPMENT - $(30\ \text{GAL/DAY})(60\ \text{DAYS}) = 1800\ \text{GAL.}$
COW PREP - $(1/4\ \text{GAL/WASH-COW})(250\ \text{COWS})(3\ \text{WASHES/DAY})(60\ \text{DAYS}) = 11250\ \text{GAL.}$

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SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

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ANIMAL WASTE MANAGEMENT CALCULATIONS (CONT.)

PARLOR FLOOR (30 GAL/DAY)(60 DAYS) = 3000 GAL
MILKHOUSE FLOOR (20 GAL/DAY)(60 DAYS) = 1200 GAL

~~44,250 GAL~~
(≈ 5900 FT³)

RUNOFF (CN=95) $S = \left(\frac{1000}{95}\right) - 10 = 0.53$

$I_a = 0.2(0.53) = 0.10$

DEC 3.30 IN $Q = \frac{(3.30 - 0.10)^2}{[(3.30 - 0.10) + 0.53]}$

$= 2.74$ IN

LESS EVAPORATION -1.02

1.72 IN

JAN 3.39 $Q = \frac{(3.39 - 0.10)^2}{[(3.39 - 0.10) + 0.53]}$

$= 2.83$ IN

LESS EVAPORATION -1.02 IN

1.82 IN

RUNOFF (60 DAYS) = 1.72 IN + 1.82 IN = 3.54 IN (0.295 FT)

RUNOFF VOLUME ⇒ (0.295 FT)(1.6 AC)(43,560 FT²/AC) = 20,560 FT³

25 YR - 24 HR STORM = 7.5 IN $Q = \frac{(7.5 - 0.10)^2}{[(7.5 - 0.10) + 0.53]}$

$= 6.90$ INCHES
(0.575 FT)

STORM VOLUME = (0.575 FT)(1.6 AC)(43,560 FT²/AC) = 40,075 FT³

OCTOBER 17, 1995

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

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ANIMAL WASTE MANAGEMENT SYSTEM CALCULATIONS (CONT.)

TOTAL VOLUME = PARLOR WASTEWATER + NORMAL RUNOFF
+ 25YR, 24HR STORM EVENT RUNOFF
$= 5900 FT^3 + 20,560 FT^3 + 40,075 FT^3$
$= 66,535 FT^3$ (497,682 GAL)

NUTRIENT CONTENT

ANALYSIS: 2.5# N, 0.8# P_2O_5, 1.7# K_2O / 1000 GAL

ANNUAL NITROGEN TO BE APPLIED (LIQUID WASTE)

$20,560 FT^3/60 DAYS + 5900 FT^3/60 DAYS = 26,460 FT^3/60 DAYS$

$(26,460 FT^3/60 DAYS)(365 DAYS/YR) = 160,965 FT^3/YR$
$(1.2 \times 10^6 GAL/YR)$

ANNUAL N (LIQUID WASTE ONLY) $= (1.2 \times 10^6 GAL/YR)(2.5\# N/1000 GAL)$
$= 3010\# N/YR$

STORAGE LOSSES → ASSUME ZERO FOR HIGH DILUTION AND SHORT STORAGE PERIOD

PAN → $(3010\# N)(49\%) = 1475\# N$ (MINERALIZATION)

CROP REQUIREMENTS → TALL FESCUE (YIELD = 3.5 TONS/YEAR/AC
N CONCENTRATION = 1.97% ⇒ 138 LBS N/AC

LEACHING → $138\# N/YR\text{-}AC / .90 = 153\# N/YR\text{-}AC$

APPLICATION LOSSES → (IRRIGATION) $(153\# N/YR\text{-}AC)/0.75 = 204\# N/YR\text{-}AC$

OCTOBER 17, 1995

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

ANIMAL WASTE MANAGEMENT CALCULATIONS (CONT.)

DENITRIFICATION → (204 #N/YR·AC) / 0.40 = 510 #N/YR·AC

LAND REQUIREMENT = PAN / PLANT UPTAKE (INCLUDES LOSSES)

= 1475 #N / ~~204~~ 510 #N/YR·AC

= ~~1.23 ACRES~~ (TALL FESCUE HAYLAND)

= 2.9 ACRES

02/09/96

PREPARED BY J. YOUNG

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA
ANIMAL WASTE MANAGEMENT SYSTEM

WASTE STORAGE PIT DESIGN PARAMETERS

MINIMUM SERVICE LIFE = 10 YEARS (REINFORCED CONCRETE STRUCTURE)

VOLUME ⇒ MANURE: 15,765 FT³ (30 DAYS / 250 COWS / 1000# EA)

EXISTING STORAGE = 8400 FT³

ADDITIONAL STORAGE REQUIRED = 7365 FT³

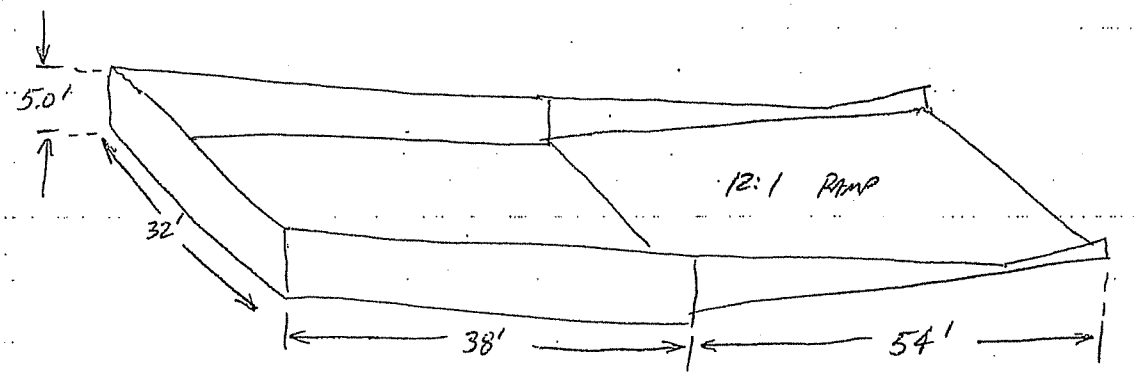
25 YEAR, 24 HOUR STORM STORAGE (NO ROOF PER FARMER'S REQUEST)

= 7.5 IN × SURFACE AREA OF TANK

$= \left(\frac{7.5\text{ IN}}{12\text{ IN/FT}}\right)(32\text{ FT})(92\text{ FT}) = 1840\text{ FT}^3$

VOLUME = 9205 FT³

NOTE: PRECIPITATION LESS EVAPORATION DURING 30 DAY STORAGE PERIOD IS NOT CONSIDERED. IT IS ASSUMED THE AIR VOIDS IN THE MANURE AND SAWDUST BEDDING WILL PROVIDE ADEQUATE STORAGE.



DESIGN DEPTH = 4.5 FT (0.5 FT. FREEBOARD)

DESIGN VOLUME = 9360 FT³

SMALL ACRES DAIRY / A.W.M.S. 02/09/96

STRUCTURAL LOADINGS

LATERAL EARTH PRESSURE → 85 LBS/FT³ E.F.P.

LIVE LOAD SURCHARGE ON BACK FILL → 100 LBS/FT³

POSITIVE DRAINAGE MUST BE INSTALLED!

INTERNAL LATERAL PRESSURE → 65 LBS/FT³

ACI-318 SPECIFICATIONS USED

3000 PSI (f'_c) CONCRETE

STEEL F_y = 40,000 PSI ; f_s = 20000 PSI

SLAB SHALL BE DESIGNED FOR A 5000 LB. WHEEL LOAD

* DISTANCE TO NEAREST RESIDENCE (NOT OWNED BY FARMER) IS APPROXIMATELY 700 FT.

OPERATION OF STRUCTURE

DEPTH OF MAXIMUM ALLOWABLE STORAGE (LESS 25 YR, 24 HR STORM EVENT): 3'-10"

* DISTANCE TO NEAREST WELL IS APPROXIMATELY ____ FT.

SMALL ACRES DAIRY / A.W.M.S. 02/09/96

WASTE STORAGE POND DESIGN PARAMETERS

STORAGE VOLUME: 79,000 FT^3 + PRECIPITATION FALLING DIRECTLY ON THE POND SURFACE

STORAGE PERIOD: 60 DAYS (NRCS MINIMUM)

DISTANCE TO NEAREST RESIDENCE NOT OWNED BY FARMER IS APPROXIMATELY 700 FT.

DISTANCE TO NEAREST WELL IS APPROXIMATELY 400 FT.

HAZARD CLASS EVALUATION

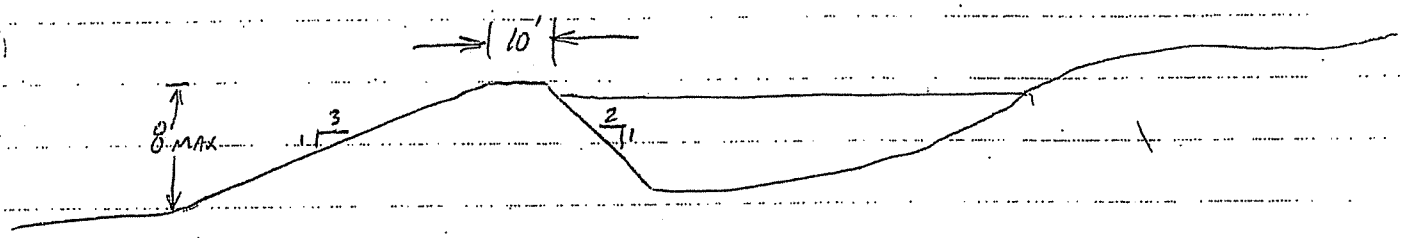
LAND USE OF AREA DOWNSTREAM OF IMPOUNDMENT IS AGRICULTURAL CROPLAND. STATE ROAD #1345 IS LOCATED APPROXIMATELY 600 FEET DOWNSTREAM OF POND. DOWNSTREAM AREA IS UNSUITED FOR DEVELOPMENT SINCE IT IS LOCATED IN THE 100 YEAR FLOOD PLAIN OF THE FRENCH BROAD RIVER. NO UTILITIES.

MAXIMUM DAM HEIGHT ⇒ 8'-0"

MAXIMUM VOLUME IMPOUNDED ⇒ 2.5 AC-FT

DAM CLASSIFICATION CLASS A (LOW HAZARD)

PER NCAC T15A : 02K . 0105



10% SETTLEMENT IF COMPACTION LAYER EXCEEDS 9" AND EXTENSIVE COMPACTION IS APPLIED.

OH-Ver 2.21

US Department of Agriculture
Natural Resources Conservation Service

A Stacking - Waste Storage Structure Design

prepared for

Small Acres Dairy
in

Henderson North County, North Carolina

Designer :
Date : 01/09/96

Checker _____
Date _____

THE RECOMMENDED DIMENSIONS ARE:

Shape	=	Rectangular
Top dimensions ..	=	32 x 110 ft.
Bottom Dimensions	=	32 x 110 ft.
Sideslopes	=	0.0 :1
Actual depth	=	5.0 ft.
Design depth	=	4.5 ft.
Freeboard	=	0.5 ft.
Depth when 1/2 full	=	2.3 ft.
Depth when 3/4 full	=	3.4 ft.

THIS FACILITY IS DESIGNED FOR THE FOLLOWING CONDITIONS:

-type of animal-	-number-	-weight-	-waste-	-days-
Dairy, Lactating	250	1400 lbs.	1.32 CuFt/1000	30

30 Days storage
1000 lbs./day of SawDust / Shavings bedding
@ 10.5 lbs./cu.ft.
(ratio of volume stored to volume used = 0.7)

When full, this facility will contain 15840 cu.ft.(118483 gal) of waste.

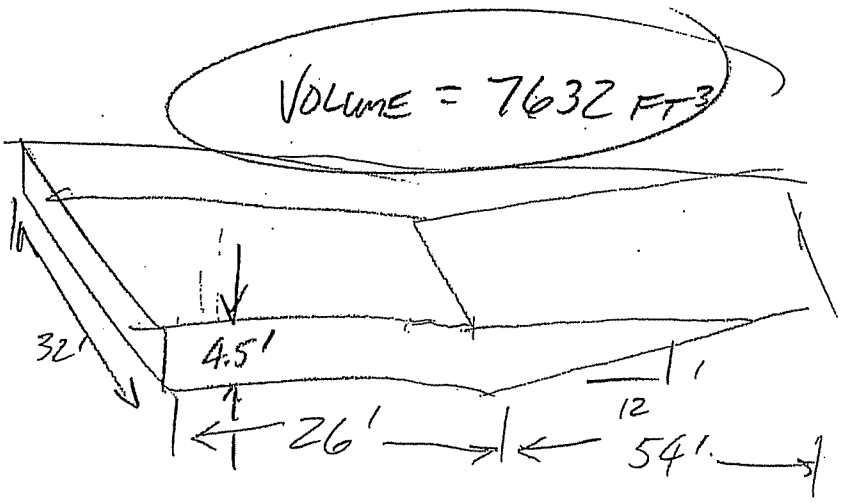
THIS DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS:

Small Acres Dairy 01-09-1996 09:03:44

Stacking - Waste Storage Structure Design

Manure Volume	13,860
Bedding Volume	1,905
Waste Water Volume	0
Feedlot Runoff	0
Rain & 25 yr. Volume ..	0
Needed Volume	15,765
Available Volume	15,840

$15{,}765 - 8400 = \underline{7365}$



RAMP VOLUME = 3888 FT³

CH-Ver 2.21

US Department of Agriculture
Natural Resources Conservation Service

A Waste Storage Pond

prepared for

Small Acres Dairy
in

Henderson North County, North Carolina

Designer :
Date : 01/05/96

Checker _____
Date _____

THE RECOMMENDED DIMENSIONS ARE:

Shape	=	Rectangular
Top dimensions ..	=	130 x 130 ft.
Bottom Dimensions	=	94 x 94 ft.
Sideslopes	=	2.0 :1
Actual depth	=	9.0 ft.
Design depth	=	8.0 ft.
Freeboard	=	1.0
Depth when 1/2 full	=	4.6 ft.
Depth when 3/4 full	=	6.4 ft.

THIS FACILITY IS DESIGNED FOR THE FOLLOWING CONDITIONS:

-type of animal-	-number-	-weight-	-waste-	-days-
Dairy, Lactating	1	1400 lbs.	1.32 CuFt/1000	60

60	Days storage (December thru February)
1000	gal/day of additional waste water.
6.7	inches of rainfall over the design period.
1.6	inches of evaporation over the design period.
7.5	inches of rainfall for a 25 yr.- 24 hr. event.
64600	sq. ft. of feedlot and roof runoff.

When full, this facility will contain 97482 cu.ft.(729165 gal) of waste.

< more >

ADDITIONAL OPTIONAL DESIGNS:

D. Storage	180 days			270 days			60 days		
Depth w/ freeboard	7	9	11	7	9	11	7	9	11
Top dimensions (ft)	130 x 384	130 x 276	130 x 224	130 x 576	130 x 402	130 x 318	130 x 166	130 x 130	130 x 112
Bottom dimen. (ft)	102 x 356	94 x 240	86 x 180	102 x 548	94 x 366	86 x 274	102 x 138	94 x 94	86 x 68
Sideslope	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1
Actual Waste (cu.ft.)	332	332	332	498	498	498	110	110	110
Total Volume (cu.ft.)	252000	225962	213333	383328	336842	312973	102888	97492	94613

THIS DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS:

The percentage of rainfall that runs off the feedlot is 85 %.

Small Acres Dairy 01-05-1996 10:43:01

Waste Storage Pond

Manure Volume	111
Bedding Volume	0
Waste Water Volume	9,021
Feedlot Runoff	70,987
Rain & 25 yr. Volume ..	17,721
Needed Volume	96,851
Available Volume	97,482

Waste Water Storage Pond Volume Calculations

250 lactating cows, 1400 pounds each, 100% confinement, 3X milking

Watershed area = 69,700 SF (1.6 AC), impervious (CN = 98)

60 day storage period

Critical rainfall period - Dec thru Feb (rainfall = 6.7 in, evaporation = 1.6 in)

25 year, 24 hour storm event = 7.5 in

WASTE WATER VOLUME = (250 cows)(1400 lbs/cow)(0.60 ft^3/day/1000 lbs)(60 days) = **12,600 ft^3**

RUNOFF VOLUME(60 day)
CN=98 S=(1000/98) - 10 = 0.20 in
Q = [(5.1 in) - 0.2(0.20 in)]^2/[5.1 in + (0.8)(0.20 in)] = 4.9 in
Volume = (4.9 in)(1 ft/12 in)(69,700 ft^2) = **27,730 ft^3**

RUNOFF VOLUME(25yr-24hr storm)
Q = [(7.5 in) - 0.2(0.20 in)]^2/[7.5 in + (0.8)(0.20 in)] = 7.3 in
Volume = (7.3 in)(1 ft/12 in)(69,700 ft^2) = **41,300 ft^3**

MINIMUM VOLUME REQUIREMENT
12,600 ft^3 + 27,730 ft^3 + 41,300 ft^3 = 81,630 ft^3

PLANNED POND VOLUME PER DESIGN APPROVED 06/27/96 = **100,710 ft^3**
(volume measured from bottom to 1.0 ft below top of dam, elev. 87.0)

Volume depth is reduced to accommodate precipitation falling directly on the pond surface and to operate the emergency spillway. Available volume is measured from the pond bottom (elev = 82 ft) to elev = 86.2 ft. (VOLUME = **81,100 ft^3 approx.)

such times as to take advantage of the maximum available nutrients from the manure for crop growth. For maximum nutrient utilization, fresh waste should be land applied and incorporated into the soil. See the WASTE UTILIZATION PLAN for further details of application.

MAINTENANCE

The SOLID WASTE STORAGE STRUCTURE will need to be inspected periodically for evidence of sloughing, seepage, boils, bulging, sink holes or misalignment. Report any damage or problems to the Henderson Soil and Water Conservation District immediately. Inspect all concrete components for major cracks.

5. CONCRETE CURBING

OVERVIEW

The CONCRETE CURBING constructed on the lot will prevent waste water from leaving the lot in any storm less severe than the twenty-five (25) year, twenty-four (24) hour storm.

MAINTENANCE

The concrete should be checked periodically for major cracks. Eliminate any vegetation growing in the CONCRETE CURBING by treatment with a herbicide.

6. VEGETATED DIVERSION

OVERVIEW

The VEGETATED DIVERSION will be located above the upper feedlot and will convey non-contaminated runoff around the upper feedlot and away from contaminated areas.

MAINTENANCE

maintenance requirements. Any evidence of sloughing, seepage, boils, bulging, sink holes or misalignment should be reported to the Henderson Soil & Water Conservation District office immediately.

2. IRRIGATION AND AGITATION SYSTEM

OVERVIEW

The IRRIGATION AND AGITATION SYSTEM consists of a PTO driven agitator, PTO driven irrigation pump, traveling irrigation gun, and aluminum pipe. The IRRIGATION AND AGITATION SYSTEM applies liquid from the waste STORAGE pond on to the adjacent pasture land.

OPERATION

Irrigation operation shall be initiated prior to the liquid level reaching the full storage level marker in the structure. When the liquid level in the WASTE WATER STORAGE POND reaches the marker, liquids must be removed by pumping from the structure into the irrigation system. Do not irrigate in such a manner as to cause runoff or erosion. Do not irrigate on frozen or saturated soils. Irrigate only until soil is near saturation point. Operation of the system and its components shall be in accordance with all manufacturers' specifications and the WASTE UTILIZATION PLAN.

MAINTENANCE

Soil test the irrigation field annually. Vegetation in the irrigation field should be inspected periodically and reseeded as needed to insure a vigorous stand. The field may also need to be limed and fertilized annually. It is essential that neither vehicles or livestock be allowed to create travel lanes within the irrigation field. The irrigation field shall be mown for hay. Mowing operations must take place only when the soil is dry, and the vegetation should not be mowed to a height of less than four(4) inches. See CRITICAL AREA PLANTING for further maintenance requirements.

The waste stored in the WASTE WATER STORAGE POND will be land applied on hayland adjacent to the farm by an IRRIGATION AND AGITATION SYSTEM. The landowner currently owns and has access to a waste pump, traveling irrigation gun, agitating pump and aluminum piping. The existing equipment is capable of applying waste in accordance to the WASTE UTILIZATION PLAN.

This animal waste management system is designed to prevent discharge of animal waste to surface waters except as a result of a storm event more severe than the twenty-five (25) year, twenty-four (24) hour storm, as required by NC DEHNR-DEM Administrative Code Section: 15A NCAC 2H .0200.

All maintenance and operation costs are the responsibility of the landowner and cannot be cost shared.

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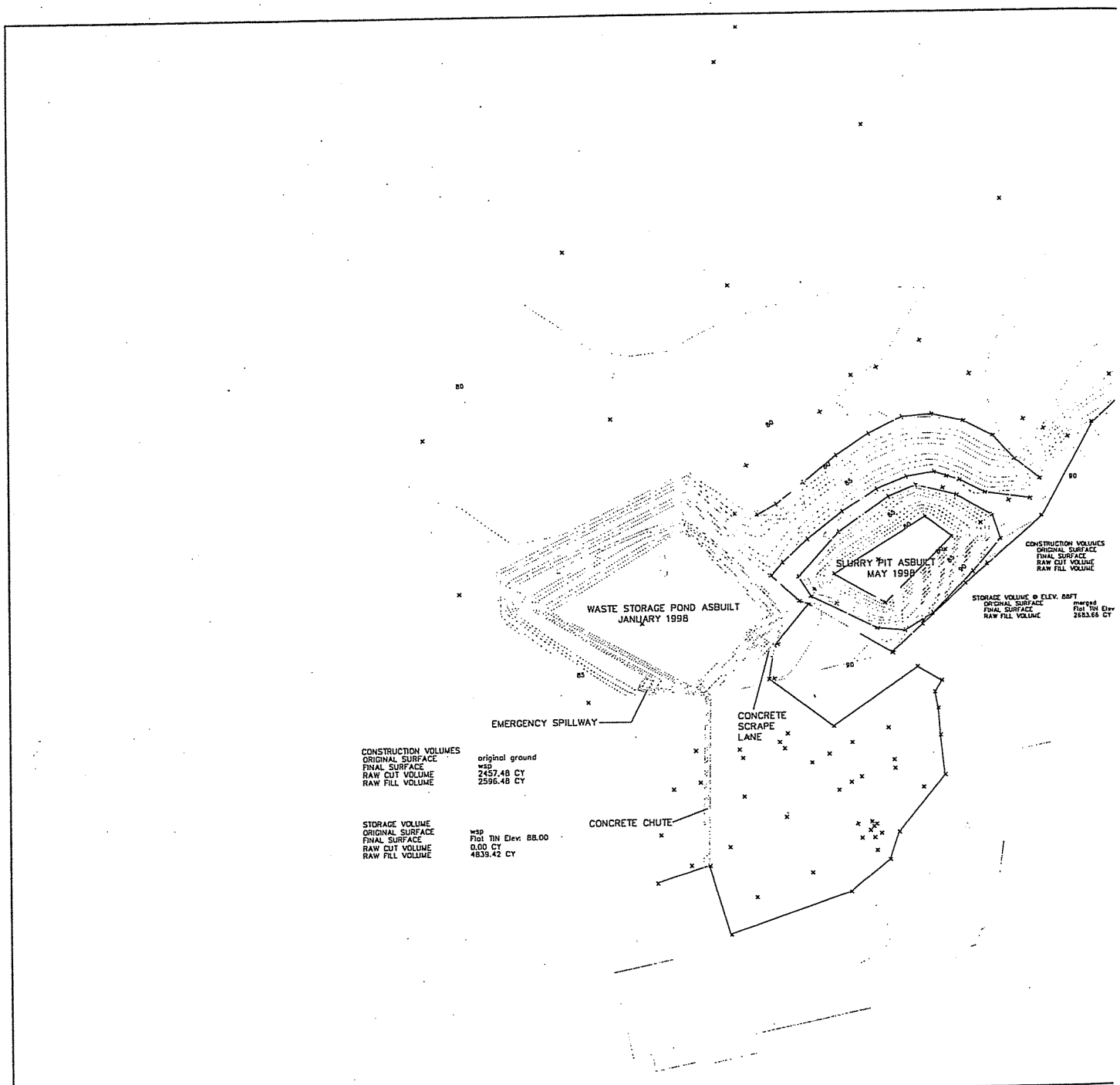


STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF SOIL AND WATER CONSERVATION
Asheville Regional Office
59 Woodfin Place, Asheville, NC 28801 PHONE: (828) 251-6208

Small Acres Dairy Farm
Waste Pond & Slurry Pit Asbuilt Site Pl
Henderson County, North Carolina

fill
12.65 CY
55.31 CY

SCALE: 1"=50'

REVISIONS					
NO.	BY	DATE	DESCRIPTION		
1					
2					
3					
4					
5					

PROJECT #: small_ac	SCALE: 1 inch = 50 feet
DRAWN BY: M. Kirkpatrick	DATE: May 1998
CHECKED BY:	DATE:
SHEET NO. 1 OF 1	FILENAME: slurosbl.dwg

ADDITIONAL OPTIONAL DESIGNS:

D. Storage	180 days			270 days			60 days		
Depth w/ freeboard	7	9	11	7	9	11	7	9	11
Top dimensions (ft)	130 x 384	130 x 276	130 x 224	130 x 576	130 x 402	130 x 318	130 x 166	130 x 130	130 x 112
Bottom dimen. (ft)	102 x 356	94 x 240	86 x 180	102 x 548	94 x 366	86 x 274	102 x 138	94 x 94	86 x 68
Sideslope	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1	2 :1
Annual Waste (cu.ft.)	332	332	332	498	498	498	110	110	110
Total Volume (cu.ft.)	262000	225962	213333	383328	336842	312973	102888	97492	94613

THIS DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS:

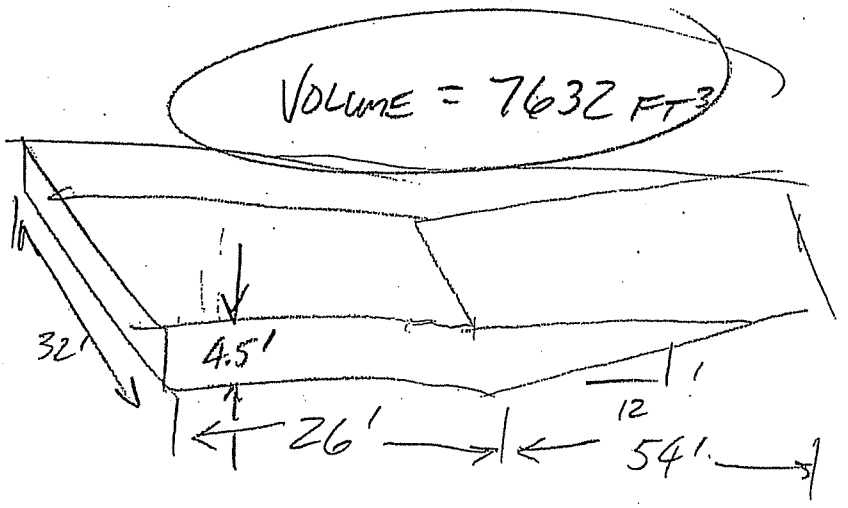
The percentage of rainfall that runs off the feedlot is 85 %.

Small Acres Dairy 01-09-1996 09:03:44

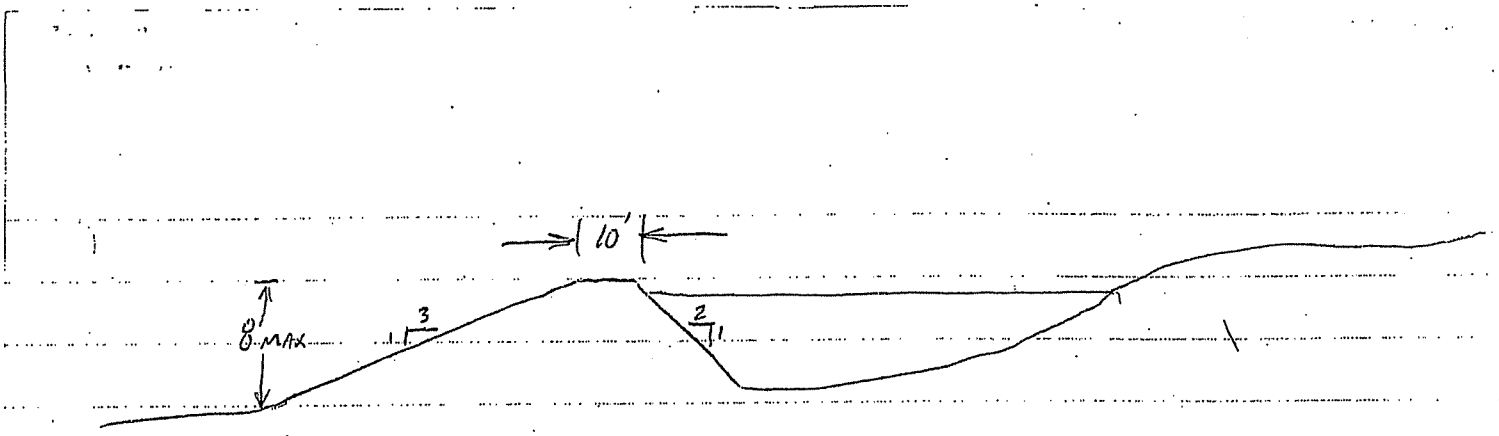
Stacking - Waste Storage Structure Design

Manure Volume	13,860
Bedding Volume	1,905
Waste Water Volume	0
Feedlot Runoff	0
Rain & 25 yr. Volume ..	0
Needed Volume	15,765
Available Volume	15,840

$15{,}765 - 8400 = \underline{7365}$



RAMP VOLUME = 3888 FT³



60% SETTLEMENT IF COMPACTION LAYER EXCEEDS 9" AND EXTENSIVE COMPACTION IS APPLIED.

SMALL ACRES DAIRY / A.W.M.S. 02/09/96

STRUCTURAL LOADINGS

LATERAL EARTH PRESSURE → 85 LBS/FT³ E.F.P.

LIVE LOAD SURCHARGE ON BACK FILL → 100 LBS/FT³

POSITIVE DRAINAGE MUST BE INSTALLED!

INTERNAL LATERAL PRESSURE → 65 LBS/FT³

ACI-318 SPECIFICATIONS USED

3000 PSI (f'_c) CONCRETE

STEEL F_y = 40,000 PSI ; f_s = 20000 PSI

SLAB SHALL BE DESIGNED FOR A 5000 LB. WHEEL LOAD

* DISTANCE TO NEAREST RESIDENCE (NOT OWNED BY FARMER) IS APPROXIMATELY 700 FT.

OPERATION OF STRUCTURE

DEPTH OF MAXIMUM ALLOWABLE STORAGE (LESS 25 YR, 24 HR STORM EVENT): 3'-10"

* DISTANCE TO NEAREST WELL IS APPROXIMATELY ____ FT.

OCTOBER 17, 1995

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

ANIMAL WASTE MANAGEMENT CALCULATIONS (CONT.)

DENITRIFICATION → (204 #N/YR AC) / 0.40 = 510 #N/YR AC

LAND REQUIREMENT = PAN / PLANT UPTAKE (INCLUDES LOSSES)

= 1475 #N / 510 #N/YR AC

= ~~1.23 ACRES~~ (TALL FESCUE HAYLAND)

= 2.9 ACRES

OCTOBER 17, 1995

SMALL ACRES DAIRY
HENDERSON COUNTY, NORTH CAROLINA

2/4

ANIMAL WASTE MANAGEMENT CALCULATIONS (CONT.)

PARLOR FLOOR (50 GAL/DAY)(60 DAYS) = 3000 GAL
MILKHOUSE FLOOR (20 GAL/DAY)(60 DAYS) = 1200 GAL

~~14,250 GAL~~
(≈ 5900 FT³)

RUNOFF (CN=95) $S = \left(\frac{1000}{95}\right) - 10 = 0.53$

$I_a = 0.2(0.53) = 0.10$

DEC 3.30 IN $Q = (3.30 - 0.10)^2 / [(3.30 - 0.10) + 0.53]$
$= 2.74$ IN

LESS EVAPORATION −1.02

1.72 IN

JAN 3.39 $Q = (3.39 - 0.10)^2 / [(3.39 - 0.10) + 0.53]$
$= 2.83$ IN

LESS EVAPORATION −1.02 IN

1.82 IN

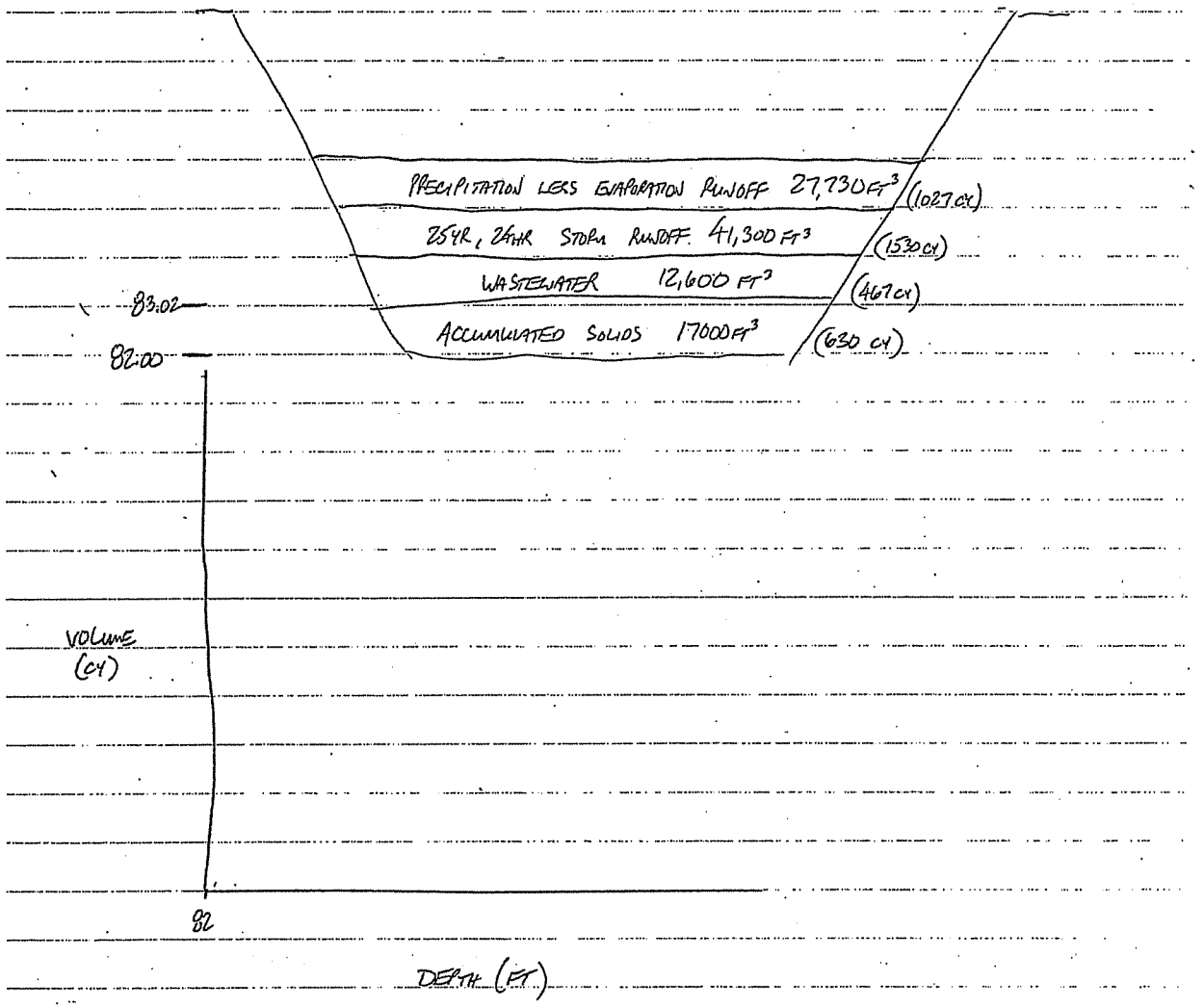
RUNOFF (60 DAYS) = 1.72 IN + 1.82 IN = 3.54 IN (0.295 FT)

RUNOFF VOLUME ⇒ (0.295 FT)(1.6 AC)(43,560 FT²/AC) = 20,560 FT³

25 YR-24 HR STORM = 7.5 IN $Q = (7.5 - 0.10)^2 / [(7.5 - 0.10) + 0.53]$
$= 6.90$ INCHES
(0.575 FT)

STORM VOLUME = (0.575 FT)(1.6 AC)(43560 FT²/AC) = 40,075 FT³

CALCULATIONS (CONT.)



CALCULATIONS:

TABLE 4-6 AWMFH

WASTE WATER VOLUME

$(250\ \text{COWS})(400\ \text{LBS/COW})(0.60\ \text{FT}^3/1000\ \text{LBS})(60\ \text{DAYS}) =$

$12{,}600\ \text{FT}^3 / 60\ \text{DAYS}$

RUNOFF VOLUME

1.6 ACRES ($69{,}700\ \text{FT}^2$) IMPERVIOUS AREA

CONCRETE LOT AND ROOF STRUCTURES

$CN = 98$

$S = \left(\frac{1000}{98}\right) - 10 = 0.20\ \text{IN}$

RAINFALL LESS EVAPORATION $= 6.7\ \text{IN} - 1.6\ \text{IN} = 5.1\ \text{IN}$

$$Q_{\text{PRECIP.}} = \frac{[(5.1\ \text{IN}) - 0.2(0.20\ \text{IN})]^2}{[5.1\ \text{IN} + (0.8)(0.20\ \text{IN})]}$$

$= 4.9\ \text{IN}$

$$\text{RUNOFF VOLUME}_{\text{PRECIP}} = (4.9\ \text{IN})(1\ \text{FT}/12\ \text{IN})(67{,}900\ \text{FT}^2) = 27730\ \text{FT}^3$$

$$Q_{\text{25YR 24HR STORM}} = \frac{[(7.5\ \text{IN}) - 0.2(0.20\ \text{IN})]^2}{[(7.5\ \text{IN}) + 0.8(0.20\ \text{IN})]}$$

$= 7.3\ \text{IN}$

$$\text{RUNOFF VOLUME}_{\text{25YR-24HR STORM}} = (7.3\ \text{IN})(1\ \text{FT}/12\ \text{IN})(67{,}900\ \text{FT}^2) = 41{,}300\ \text{FT}^3$$

COST ESTIMATE
(Based on NCACSP Average Cost Guide PY 96)

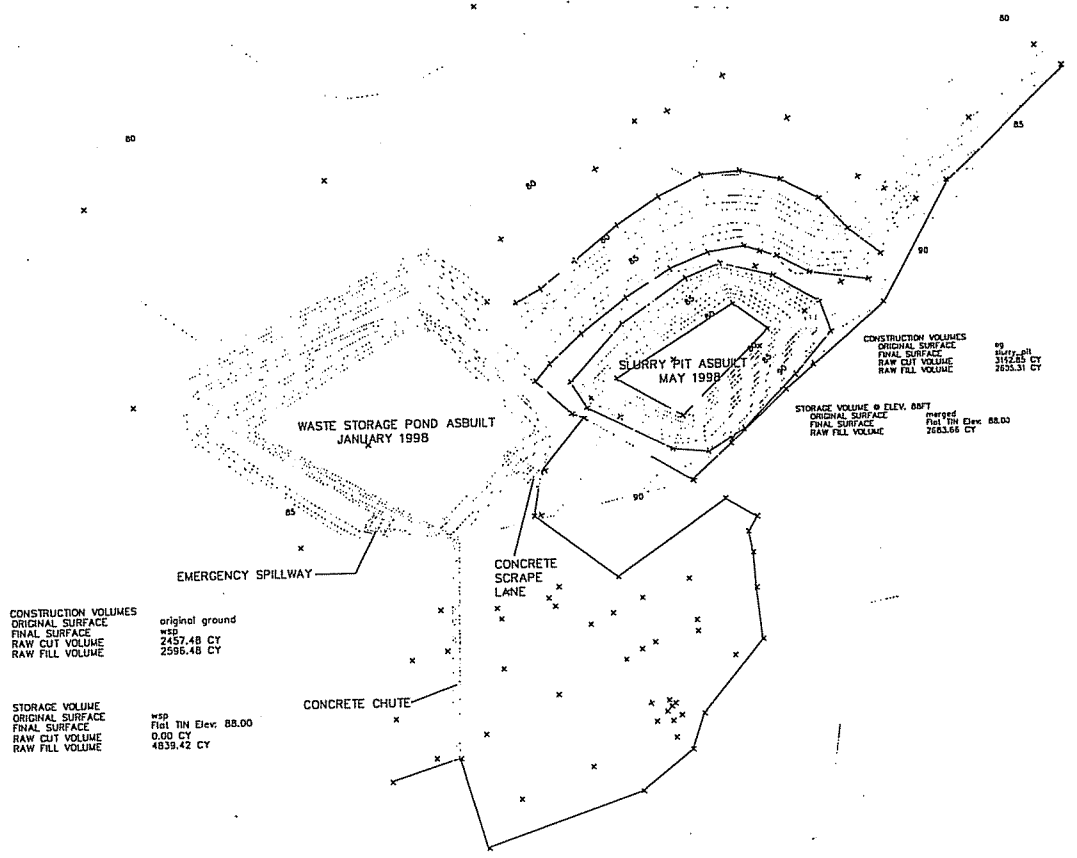
Waste Water Storage Pond
Excavation: 2280 CY @ $2.00/CY = $4560.00
Fill (including compaction): 2200 CY @ $2.30/CY = $5060.00
Concrete entry chutes: 2 @ 3.5 CY ea = 7 CY @ $100.00/CY = $700.00
Reinforcing steel (6x6-10x10 wwf): 500 SF = 110 lbs @ $.74/lb = $81.40
Critical area planting (dam): 0.25 AC @ $203.00/AC = $50.75
Mulching (dam): 0.25 AC @ $300.00/AC = $75.00
Silt fence: 500 LF @ $1.00/LF = $500.00
Total: $11,027.15

Solid Waste Storage Pit
Excavation: 1260 CY @ $2.00/CY = $2520.00
Fill (including compaction): 780 CY @ $2.30/CY = $1794.00
Concrete slab: 90 CY @ $100.00/CY = $9000.00
Concrete ramp: 12 CY @ $100.00/CY = $1200.00
Reinforcing steel (6x6-10x10 wwf): 900 SF = 190 lbs @ $.74/lb = $140.60
Critical area planting (dam): 0.15 AC @ $203.00/AC = $30.45
Mulching (dam): 0.15 AC @ $300.00/AC = $45.00
Total: $14,730.05

Push-off Ramp A
Concrete: 6 CY @ $100.00/CY = $600.00
Curbing: 1 CY @ $250.00/CY = $250.00
Reinforcing steel (6x6-10x10 wwf): 340 SF = 71 lbs @ $.74/lb = $52.54
Reinforcing steel (#4): 100 LF = 67 lbs @ $.74/lb = $49.58
Push-off barrier: ($200 estimate)
Total: $1,152.12

Push-off Ramp B
Concrete: 5.5 CY @ $100.00/CY = $550.00
Curbing: 2 CY @ $250.00/CY = $500.00
Reinforcing steel (6x6-10x10 wwf): 280 SF = 60 lbs @ $.74/lb = $44.40
Reinforcing steel (#4): 200 LF = 134 lbs @ $.74/lb = $99.16
Push-off barrier: ($200 estimate)
Total: $1,393.56

Concrete Curbing (170 LF)
Concrete: 13 CY @ $250.00/CY = $3250.00
Reinforcing steel (#4): 925 LF = 618 lbs @ $.74/lb = $457.32
Total: $3,707.32



SCALE: 1"=50'

ORTH CAROLINA
MENT AND NATURAL RESOURCES
ND WATER CONSERVATION
Regional Office
PHONE: (828) 251-6208

Small Acres Dairy Farm
Waste Pond & Slurry Pit Asbuilt Site Plan

Henderson County, North Carolina

REVISIONS			
NO.	BY	DATE	DESCRIPTION
1			
2			
3			
4			
5			

PROJECT #: sm
DRAWN BY: M.
CHECKED BY:
SHEET NO. 1 O

Animal Waste Land Application Calculations

All computations determining application rates and loadings of animal waste to hayland and row crops are found in the WASTE UTILIZATION PLAN attached at the end of this document. Application of animal waste shall be in accordance the WASTE UTILIZATION PLAN will follow the following criteria.

1. The waste utilization plan will include all the waste generated on the farm.

2. Animal waste shall not be applied to wetlands or surface water or shall not reach wetlands or surface waters of the state by runoff, drift, manmade conveyances, direct application, or direct discharge during operation or land application. Proper application rate and method shall be used to ensure these specifications are met.

3. Animal waste shall be applied on land eroding at less than 5 tons per acre per year. Waste may be applied to land eroding at more than 5 tons per acre providing grass filter strips are installed where runoff leaves the field.

4. Animal waste shall not be applied to saturated soils, during rainfall events, or when the surface is frozen. When animal waste is to be applied on areas subject to flooding, it will be soil incorporated on conventionally tilled cropland. When applied to conservation tilled crops or grassland, the waste may be broadcast provided the application does not occur during a season prone to flooding.

5. Waste shall not be applied more than 30 days prior to planting of the crop or forages breaking dormancy. A suitable cover crop should be planted to scavenge nutrients especially in sandy, leachable soils. On soils with a high potential for leaching, multiple applications at lower rates should be used.

6. Animal waste shall not be applied closer than 25 feet to surface water. This distance may be reduced for waters that are not perennial provide adequate vegetative filter strips are present.

7. Animal waste shall not be applied closer than 100 feet to wells.

8. Animal waste shall not be applied within 200 feet of dwellings other than those owned by the landowner.

9. Waste shall be applied in a manner not to reach other property and public right-of-ways.

10. Animal waste applied on grassed waterways shall be at agronomic rates and in a manner that causes no runoff or drift from the site.

Small Acres Dairy

EMERGENCY ACTION PLAN

PHONE NUMBERS

DWQ (828) 296-4500
EMERGENCY MANAGEMENT SYSTEM (828) 697-4527
SWCD (828) 697-4949
NRCS (828) 693-1629 ext. 3

This plan will be implemented in the event that wastes from your operation are leaking, overflowing, or running off site. You should not wait until wastes reach surface waters or leave your property to consider that you have a problem. You should make every effort to ensure that this does not happen. This plan should be posted in an accessible location for all employees at the facility. The following are some action items you should take.

1. Stop the release of wastes. Depending on the situation, this may or may not be possible. Suggested responses to some possible problems are listed below.

   A. Lagoon overflow-possible solutions are:

      a. Add soil to berm to increase elevation of dam.
      b. Pump wastes to fields at an acceptable rate.
      c. Stop all flows to the lagoon immediately.
      d. Call a pumping contractor.
      e. Make sure no surface water is entering lagoon.

   B. Runoff from waste application field-actions include:

      a. Immediately stop waste application.
      b. Create a temporary diversion to contain waste.
      c. Incorporate waste to reduce runoff.
      d. Evaluate and eliminate the reason(s) that caused the runoff.
      e. Evaluate the application rates for the fields where runoff occurred.

   C. Leakage from the waste pipes and sprinklers-action include:

      a. Stop recycle pump.
      b. Stop irrigation pump.
      c. Close valves to eliminate further discharge.
      d. Repair all leaks prior to restarting pumps.

   D. Leakage from flush systems, houses, solid separators-action include:

      a. Stop recycle pump.
      b. Stop irrigation pump.
      c. Make sure no siphon occurs.
      d. Stop all flows in the house, flush systems, or solid separators.

e. Repair all leaks prior to restarting pumps.

E. Leakage from base or sidewall of lagoon. Often this is seepage as opposed to

a. Dig a small sump or ditch away from the embankment to catch all seepage, put in a submersible pump, and pump back to the lagoon.
b. If holes are caused by burrowing animals, trap or remove animals and fill holes and compact with a clay type soil.
c. Have a professional evaluate the condition of the side walls and lagoon bottom as soon as possible.

2. Assess the extent of the spill and note any obvious damages.

a. Did the waste reach any surface waters?
b. Approximately how much was released and for what duration?
c. Any damage noted, such as employee injury, fish kills, or property damage?
d. Did the spill leave the property?
e. Does the spill have the potential to reach surface waters?
f. Could a future rain event cause the spill to reach surface waters?
g. Are potable water wells in danger (either on or off of the property)?
h. How much reached surface waters?

3. Contact appropriate agencies.

a. During normal business hours, call your DWQ (Division of Water Quality) regional office; Phone - - . After hours, emergency number: 919-733-3942. Your phone call should include: your name, facility, telephone number, the details of the incident from item 2 above, the exact location of the facility, the location or direction of movement of the spill, weather and wind conditions. The corrective measures that have been under taken, and the seriousness of the situation.

1Q
1) 296-4500
rgency #
)0-858-0368

b. If spill leaves property or enters surface waters, call local EMS phone number (828) 697-4527
c. Instruct EMS to contact local Health Department.
d. Contact CES, phone number - - , local SWCD office phone number - - , and local NRCS office for advice/technical assistance phone number (828) 693-1629 ext. 3

S
) 697-4891
)CD
) 697-4949

4. If none of the above works call 911 or the Sheriff's Department and explain your problem to them and ask that person to contact the proper agencies for you.

5. Contact the contractor of your choice to begin repair of problem to minimize off-site damage.

a. Contractors Name: Orren Enterprise (Gene)
b. Contractors Address: 35 Country Wood Way

e. Repair all leaks prior to restarting pumps.

E. Leakage from base or sidewall of lagoon. Often this is seepage as opposed to

a. Dig a small sump or ditch away from the embankment to catch all seepage, put in a submersible pump, and pump back to the lagoon.
b. If holes are caused by burrowing animals, trap or remove animals and fill holes and compact with a clay type soil.
c. Have a professional evaluate the condition of the side walls and lagoon bottom as soon as possible.

2. Assess the extent of the spill and note any obvious damages.

a. Did the waste reach any surface waters?
b. Approximately how much was released and for what duration?
c. Any damage noted, such as employee injury, fish kills, or property damage?
d. Did the spill leave the property?
e. Does the spill have the potential to reach surface waters?
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S
)697-4891
)CD
)697-4949

4. If none of the above works call 911 or the Sheriff's Department and explain your problem to them and ask that person to contact the proper agencies for you.

5. Contact the contractor of your choice to begin repair of problem to minimize off-site damage.

a. Contractors Name: Orren Enterprise (Gene)
b. Contractors Address: 35 Country Wood Way

c. Contractors Phone: (828) 891-4272

6. Contact the technical specialist who certified the lagoon (NRCS, Consulting Engineer, etc.

a. Name: Jeff Young P.E.
b. Phone: (828) 296-4500

7. Implement procedures as advised by DWQ and technical assistance agencies to rectify the damage, repair the system, and reassess the waste management plan to keep problems with release of wastes from happening again.

Small Acres Dairy

Insect Control Checklist for Animal Operations

Source		Cause		BMPs to Minimize Insects	Site Specific Practices
				Liquid Systems	
Flush Gutters	●	Accumulation of Solids	☒	Flush system is designed and operated sufficiently to remove accumulated solids from gutters as designed;	
			☒	Remove bridging of accumulated solids at discharge	
Lagoons and Pits	●	Crusted Solids	☒	Maintain lagoons, settling basins and pits where pest breeding is apparent to minimize the crusting of solids to a depth of no more than 6 - 8 inches over more than 30% of surface.	
Excessive Vegetative Growth	●	Decaying vegetation	☒	Maintain vegetative control along banks of lagoons and other impoundments to prevent accumulation of decaying vegetative matter along water's edge on impoundment's perimeter.	
				Dry Systems	
Feeders	●	Feed Spillage	☒	Design, operate and maintain feed systems (e.g., bunkers and troughs) to minimize the accumulation of decaying wastage.	
			☒	Clean up spillage on a routine basis (e.g., 7 - 10 day interval during summer; 15-30 day interval during winter).	
Feed Storage	●	Accumulation of feed residues	☒	Reduce moisture accumulation within and around immediate perimeter of feed storage areas by insuring drainage away from site and/or providing adequate containment (e.g., covered bin for brewer's grain and similar high moisture grain products).	
		N/A	☐	Inspect for and remove or break up accumulated solids in filter strips around feed storage as needed.	
Animal Holding Areas	●	Accumulations of animal wastes and feed wastage	☒	Eliminate low areas that trap moisture along fences and other locations where waste accumulates and disturbance by animals is minimal.	
			☒	Maintain fence rows and filter strips around animal holding areas to minimize accumulations of wastes (i.e. inspect for and remove or break up accumulated solids as needed.	

Source	Cause	BMPs to Minimize Insects	Site Specific Practices
Dry Manure Handling Systems	Accumulations of animal wastes	Remove spillage on a routine basis (e.g., 7-10 day interval during summer; 15-30 day interval during winter) where manure is loaded for land application or disposal. Provide fo adequate drainage around manure stockpiles. Inspect for an remove or break up accumulated wastes in filter strips around stockpiles and manure handling areas as needed.	

For more information contact the Cooperative Extension Service, Department of Entomology, Box 7613, North Carolina State University, Raleigh, NC 27695-7613

Source	Cause	BMPs to Minimize Insects	Site Specific Practices
Dry Manure Handling Systems	● Accumulations of animal wastes	☒ Remove spillage on a routine basis (e.g., 7-10 day interval during summer; 15-30 day interval during winter) where manure is loaded for land application or disposal. ☒ Provide fo adequate drainage around manure stockpiles. ☒ Inspect for an remove or break up accumulated wastes in filter strips around stockpiles and manure handling areas as needed.	

For more information contact the Cooperative Extension Service, Department of Entomology, Box 7613, North Carolina State University, Raleigh, NC 27695-7613

Small Acres Dairy

Dairy Farm Waste Management Odor Control Checklist

Source	Cause	BMPs to Minimize Odor	Site Specific Practices
Farmstead	● Dairy Production	☒ Vegetative or wooded buffers; ☒ Recommended best management practices; ☒ Good judgement and common sense	
Paved lots or barn alley surfaces	● Wet manure-covered surfaces	☒ Scrape or flush daily; ☒ Promote drying with proper ventilation; ☒ Routine checks and maintenance on waterers, hydrants, pipes, stock tanks	
Bedded areas	● Urine; ● Partial microbial decomposition	☒ Promote drying with proper ventilation; ☒ Replace wet or manure-covered bedding	
Manure dry stacks	● Partial microbial decomposition	☒ Provide liquid drainage for stored manure	
Storage tank or basin surface	● Partial microbial decomposition; ● Mixing while filling; ● Agitation while emptying	☐ Bottom or mid-level loading; ☐ Tank covers; ☒ Basin surface mats of solids; ☒ Minimize lot runoff and liquid additions; ☒ Agitate only prior to manure removal; ☒ Proven biological additives or oxidants	
Settling basin surfaces N|A	● Partial microbial decomposition; ● Mixing while filling; ● Agitation while emptying	☐ Liquid drainage from settled solids; ☐ Remove solids regularly	
Manure, slurry, or sludge spreader outlets N|A	● Agitation when spreading; ● Volatile gas emissions	☐ Soil injection of slurry/sludges; ☐ Wash residual manure from spreader after use; ☐ Proven biological additives or oxidants	
Uncovered manure, slurry or sludge on field surfaces	● Volatile gas emissions while drying	☐ Soil injection of slurry/sludges; ☐ Soil incorporation within 48 hrs; ☒ Spread in thin uniform layers for rapid drying; ☐ Proven biological additives or oxidants	
Flush tanks N|A	● Agitation of recycled lagoon liquid while tanks are filling	☐ Flush tank covers; ☐ Extend fill lines to near bottom of tanks with anti-siphon vents	
Outside drain collection or junction boxes N|A	● Agitation during wastewater conveyance	☐ Box covers	

Source	Cause	BMPs to Minimize Odor	Site Specific Practices
Lift stations N/A	● Agitation during sump tank filling and drawdown	☐ Sump tank covers	
End of drainpipes at lagoon	● Agitation during wastewater conveyance	☒ Extend discharge point of pipes underneath lagoon liquid level	
Lagoon surfaces	● Volitile gas emission; ● Biological mixing; ● Agitation	☐ Proper lagoon liquid capacity; ☐ Correct lagoon startup procedures; ☐ Minimum surface area-to-volume ratio; ☐ Minimum agitation when pumping; ☐ Mechanical aeration; ☐ Proven biological additives	
N/A			
Irrigation sprinkler nozzles	● High pressure agitation; ● Wind drift	☒ Irrigate on dry days with little or no wind; ☒ Minimum recommended operating pressure; ☒ Pump intake near lagoon liquid surface; ☐ Pump from second stage lagoon; ☐ Flush residual manure from pipes at end of slurry/sludge pumpings	
Dead animals	● Carcass decomposition	☒ Proper disposition of carcasses	
Standing water around facilities	● Improper drainage; ● Microbial decomposition of organic matter	☒ Grade and landscape such that water drains away from facilities	
Mud tracked onto public roads from farm access	● Poorly maintained access roads	☒ Farm access road maintenance	

Additional Information:	Available From:
Cattle Manure Management; .0200 Rule/BMP Packet	NCSU, County Extension Center
Dairy Educational Unit Manure Management System - Lake Wheeler Road Filed Labatory ; EBAE 209-95	NCSU - BAE
Lagoon Design and Management for Livestock Manure Treatment and Storage; EBAE 103-83	NCSU - BAE
Management of Dairy Wastewater; EBAE 106-83	NCSU - BAE
Calibration of Manure and Wastewater Application Equipment; EBAE Fact Sheet	NCSU - BAE
Nuisance Concerns in Animal Manure Management: Odors and Flies; PRO107, 1995 Conference Proceedings	Florida Cooperative Extension

Source	Cause	BMPs to Minimize Odor	Site Specific Practices
Lift stations N/A	● Agitation during sump tank filling and drawdown	☐ Sump tank covers	
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N/A			
Irrigation sprinkler nozzles	● High pressure agitation; ● Wind drift	☒ Irrigate on dry days with little or no wind; ☒ Minimum recommended operating pressure; ☒ Pump intake near lagoon liquid surface; ☐ Pump from second stage lagoon; ☐ Flush residual manure from pipes at end of slurry/sludge pumpings	
Dead animals	● Carcass decomposition	☒ Proper disposition of carcasses	
Standing water around facilities	● Improper drainage; ● Microbial decomposition of organic matter	☒ Grade and landscape such that water drains away from facilities	
Mud tracked onto public roads from farm access	● Poorly maintained access roads	☒ Farm access road maintenance	

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Small Acres Dairy

Mortality Management Methods

(check which method(s) are being implemented)

☒ Burial three feet beneath the surface of the ground within 24 hours after knowledge of the death. The burial must be at least 300 feet from any flowing stream or public body of water.

☐ Rendering at a rendering plant licensed under G.S. 106-168.7.

☐ Complete incineration

☐ In the case of dead poultry only, placing in a disposal pit of a size and design approved by the Department of Agriculture.

☐ Any method which in the professional opinion of the State Veterinarian would make possible the salvage of part of a dead animal's value without endangering human or animal health. (Written approval of the State Veterinarian must be attached)

December 18, 1996